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ABSTRACT

Issues concerning telecommunications courses offered by California universities and colleges are reviewed with a focus on the progress made over the past 6 years regarding the lack of incentives for faculty to use instructional technology in their teaching, lack of coordination among interested institutions and agencies, and high initial costs for the purchase of equipment. These problems are still regarded as serious. Topics examined include: the new technologies (satellite television, microwave signals, instructional television fixed service (ITFS), computers, video teleconferencing, radio and television broadcast, cable television); uses of new technologies (administrative uses, instructional uses); policies and actions by other states (interstate activities, state initiatives); and policy issues that require statewide planning in California. Conclusions focus on opportunities to be met (e.g., providing foreign language instruction to distant campuses), objectives for state planning, (e.g., maximum creativity in using new technologies), issues for action (e.g., quality control), and role of the commission. 14 references. (SM)

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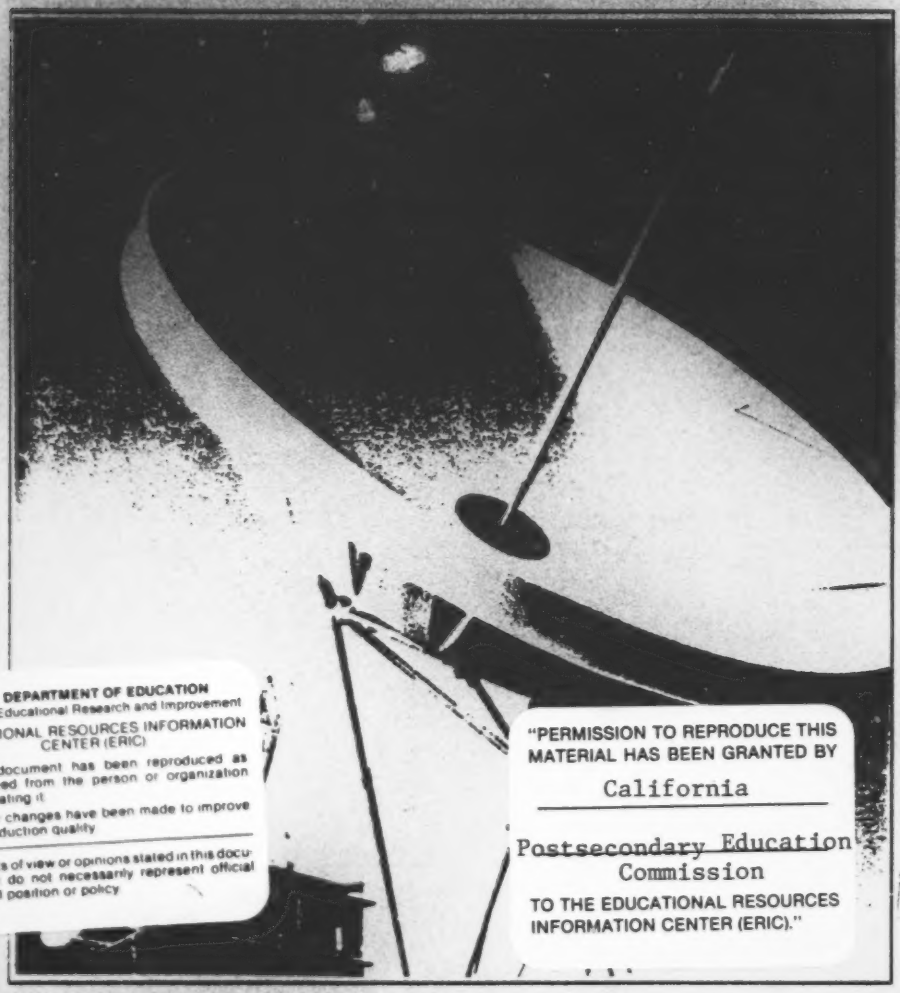

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CALIFORNIA POSTSECONDARY EDUCATION COMMISSION

HE 021 368

Summary

This document reviews issues concerning telecommunication courses offered by California's colleges and universities. Six years ago, in the Commission's last report on this topic, *Linking Californians for Learning*, the Commission identified three serious problems regarding instructional technology in postsecondary education:

1. Lack of incentives for faculty to use the technology in their teaching;
2. High initial costs for the purchase of the equipment; and
3. Lack of coordination among interested institutions and agencies.

This current report concludes that those three problems remain serious today and that little progress has been made over the past six years in developing a comprehensive statewide plan for the use of telecommunications in higher education.

The report describes the new technologies and their potential impact on higher education (pp. 1-3), illustrates creative uses of the technologies by California's higher education institutions (pp. 3-8), reviews policies and actions by other states regarding educational telecommunications (pp. 8-11), identifies policy issues in instructional technology that require State-level policy decisions in California (pp. 11-12), and presents four conclusions about these issues, including the need for a comprehensive statewide plan for the use of telecommunications in higher education and the leadership role of the Commission in developing that plan (pp. 12-13).

The Commission adopted this report at its meeting on December 14, 1987, on recommendation of its Policy Development Committee. Additional copies of the report may be obtained from the Publications Office of the Commission at (916) 322-8031. Questions about the report may be directed to Bruce D. Hamlett of the Commission staff at (916) 322-8010.

EDUCATION OFFERED VIA TELECOMMUNICATIONS

Trends, Issues, and State-Level Problems in Instructional Technology for Colleges and Universities

CALIFORNIA POSTSECONDARY EDUCATION COMMISSION
Third Floor • 1020 Twelfth Street • Sacramento, California 95814-3985

COMMISSION REPORT 87-49
PUBLISHED DECEMBER 1987

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Education Offered via Telecommunications

DURING the past decade, educational institutions have increased dramatically their use of modern technology for both on-campus and off-campus instruction. This technology ranges from computers and video discs to cable networks, direct broadcast satellites, and a nationwide satellite relay system that enables originating institutions to transmit programs to any public television station or cable system in the country. A recent national study reported that in 1984-85, more than 90 percent of the 2,830 colleges and universities surveyed used the three major types of technology -- computers, video, and audio -- for instructional purposes (Western Interstate Commission for Higher Education, 1986). Approximately one-third of the surveyed institutions utilized one-way video presentations for off-campus instruction, and almost 50 percent offered video telecourses. During the past three years, as satellite relay technology has developed, institutions have started offering live two-way interactive classrooms nationally, with classroom sites located throughout the country.

In the California Postsecondary Education Commission's first report on telecommunications, *Using Instructional Media Beyond Campus* (1979), the Commission concluded that California had no plan for developing on a statewide cooperative basis its many telecommunications resources to facilitate learning beyond the high school. Two years later, in its second report, *Linking Californians for Learning: Next Steps for Telecommunications in California Postsecondary Education*, the Commission reached the same conclusion and identified three serious problems hindering the use of telecommunications in colleges and universities:

- Lack of incentives for faculty to use the technology in their teaching;
- High initial costs for the purchase of some equipment; and
- Lack of coordination among interested institutions and agencies. In the six years that have elapsed since the publication of that report, little progress has been made in developing a comprehensive statewide plan, and the three problems remain serious.

Statewide planning regarding the use of this new technology should be initiated in order to maximize their service in achieving State educational objectives and minimize costs to the State for purchasing and maintaining equipment. The rate of technological change is so rapid and the costs for investment so great that careful decisions must be made to ensure that California does not heavily invest in equipment which will be both obsolete and ineffective in a short time. Without careful planning, technology may determine the goals of education, rather than being a means to accomplish them.

The remainder of this report (1) describes new telecommunication technology and its practical impact on higher education, (2) illustrates its creative uses by California colleges and universities, (3) reviews policies and actions by other states regarding it, (4) identifies issues regarding its use in California higher education that require State-level policy decisions, and (5) proposes a process for resolving these issues. The following pages deal less with computerized instruction than other technologies because the staff has initiated a separate project on this topic, with a prospectus for it scheduled for Commission discussion in February 1988.

What are the new technologies?

The major audio, video, and computer technologies used for instruction are listed in Display 1 on page 2 as either interactive or noninteractive, with the former permitting some minimum form of two-way communication and noninteractive technologies, when used alone, permitting communication in only one direction.

Included among these new instructional technologies are the following:

DISPLAY 1 *Telecommunication Technologies Used for Instruction*

Technology	Interactive	Noninteractive
Audio	Telephone	Radio (primary carrier)
	Audio teleconferencing	Radio (subcarrier)
		Audiotape
Video	Microwave (point-to-point)	Open-broadcast television
	Cable television (two-way)	Cable television (one-way)
	Slow scan/freeze frame television (two-way)	Videotape
	Electronic blackboard	Instructional television fixed service (ITFS)*
	Satellite television (two-way)	Satellite television (one-way)
	Video teleconferencing	Slow scan/freeze frame television (one-way)
Computer	Computer-assisted instruction	
	Computer-based instructional management	

* Instructional television fixed service is a noninteractive technology when used without telephone or radio talkback.

Source: Lewis, 1983, p. 30.

Satellite television

Communication satellites orbiting the Earth transmit video and audio signals from a single point of origin to numerous stations scattered across large geographical areas. A complete satellite operation requires an "uplink" or transmitter costing from $200,000 to $500,000 to reach one of the hundreds of satellites now in orbit, a "downlink" costing about $2,500 to receive the signal from the satellite, and a production studio or classroom for program production. Uplinks can serve the dual function of receiver and transmitter, making it possible in some cases to eliminate the need for separate downlinks. Of course, programs that are transmitted commercially for entertainment and education can be accessed with just a downlink at the receiving site.

Most colleges, unable to afford an uplink of their own, borrow time on a corporate or military uplink when it is not being used. One disadvantage of this procedure is that this borrowed time is often available only at inconvenient hours. As corporate and military users utilize their uplinks more, such borrowing will become more limited.

A particularly attractive feature of satellite operations is the ability for interaction. With the simple addition of a telephone line, participants can ask questions, debate, and clarify topics.

Microwave signals

This much less costly technology can be used to transmit either audio or video signals from one point to another. The use of relay towers permits some added flexibility to users.

Instructional Television Fixed Service (ITFS)

Using the microwave frequency reserved by the Fed-

eral Communications Commission for educational organizations, many campuses have licenses permitting the transmission of telecourses by instructional television fixed service (ITFS). This technology enables locations with the appropriate antennae to receive audio and video signals from the campus, and thereby create a closed-circuit television network. Because ITFS is a "line-of-sight" transmission, relays are necessary for remote reception.

While ITFS by itself is noninteractive, it is often used in combination with other technologies, such as the telephone, which makes it interactive.

Computers

Computer networks and microprocessor workstations have changed forever not only text writing and editing, but also the ways scientific and technical processes are taught and utilized. Computer-assisted instruction can provide individualized instruction simultaneously to large numbers of students. For example, computer-assisted design (CAD) has transformed a time-consuming, tedious task to a high-speed technical operation capable of hundreds of variations and manipulations at the touch of a key. In the sciences, many laboratory experiments are being simulated on computers before actually being carried out and computer technology exists to allow an experiment to be transmitted to dozens of workstations simultaneously, giving students a first-hand, unobstructed view of what is occurring in a way no textbook or lab manual could.

Video teleconferencing

Utilizing various technologies such as point-to-point microwave or ITFS and telephone service, video teleconferencing allows verbal and visual communication among people at multiple sites, with either a one-way or a two-way video.

Radio and television broadcast

Because of their great flexibility available at reasonable cost, radio and television broadcasts continue to be popular for instructional purposes. A particularly important feature in favor of using broadcasts is the wide availability of receivers, in that nearly every household in the nation has access to AM and FM radio as well as television. With the increased availability of video recording devices, both radio and video courses can be taped for later use and used repeatedly until material is mastered.

Some significant disadvantages to broadcast courses that use commercial stations is the inconvenient times of broadcast (typically very early morning or very late in the evening). Recording convenience has offset this problem somewhat as has the use of "off-air" broadcast via cable. Broadcast courses are seldom interactive and constitute passive learning media.

Cable television

Most large communities in California are wired for cable television and are therefore able to receive television and FM programming unaffected by weather, signal disruption by electric motors or aircraft, and "line-of-sight" limitations. For educators, cable television has the advantage over broadcast television of being available more frequently and at little or no cost. For potential learners, because of the monthly fee they must pay, cable television is more expensive than broadcast television.

How are the new technologies being used?

These technologies are being used by California colleges and universities for both administration and instruction.

Administrative uses

The technologies offer a wide variety of new methods for managing single- and multi-campus colleges and universities.

Like all large and complex organizations, postsecondary institutions can use them to administer payroll, maintain student and staff information systems, operate intercampus mail systems, and allow students and faculty to access library collections without having to visit the library. For example:

- The University of California is implementing a University Communications Network to connect its nine campuses, the Office of the President, its three medical centers, the three national laboratories, and the Lick Observatory. It anticipates

that the network's high-speed lines will be utilized by "faculty with research projects requiring affordable, reliable, and convenient data communications for access to super-computers or other computer resources; administrators who need the capability of transmitting machine-readable files; media directors who are interested in video use throughout the University; library patrons who want access to library automation services, managers and researchers needing access to data bases; and academicians and administrators who want to communicate via electronic mail" (1986).

- All 19 campuses of the California State University have closed-circuit television networks and are connected by systemwide computer, electronic mail, and facsimile transmission networks.
- The California Community Colleges are in the second year of an ambitious project to use interactive teleconferencing for 12 conferences on faculty and management development. The American Association of Community and Junior Colleges is also sponsoring two national teleconferences -- one on adult literacy and the other on economic development -- during the current academic year. Display 2 on the opposite page illustrates the current capacity of California's Community Colleges to receive satellite transmitted courses and conferences.

Nonetheless, the general lack of statewide planning, along with the absence of historical models to follow has left major educational institutions struggling with decisions about what technologies to use, whether to lease or buy equipment, and what portion of their budget should be allocated for administrative technologies and their maintenance.

Instructional uses

Within California higher education, California State University campuses have been among the leaders in utilizing the new instructional technologies. As of March 1987, 11 campuses had operational ITFS systems; 15 had satellite reception equipment; five operated National Public Radio stations while nine others had radio stations for on-campus instruction and regular radio operations; one -- San Diego State University -- ran a Public Broadcast Television station; and one other -- Chico -- had satellite transmitter capabilities (Commission for the Review of the Master Plan for Higher Education, 1987a, pp. 2-3). Display 3 summarizes these data for the State University campuses.

The California State University has also initiated a project called The California Learning Network (formerly EDUNET), which is designed to demonstate the delivery of educational programs and services via telecommunications to public educational entities, including elementary and secondary schools. As of October 1987, 200 sites were involved.

Throughout California, changes are occurring almost daily in the use of these technologies. The following paragraphs do not attempt to provide a comprehensive inventory of these uses, as the Commission offered in *Linking Californians for Learning*, but rather describe some of the more interesting and recent innovative experiments with the new information technologies within five categories:

- Satellite transmission of courses live to corporate locations throughout the country;
- Microwave transmission of courses live to remote geographical areas in California;
- Video and computer conferencing to serve populations generally underserved in higher education;
- Telecourses, involving video and printed material, to offer instruction in various locations, including students' homes; and
- Computers for instruction.

Satellite transmission of courses: California State University, Chico, has initiated a master's degree program in computer science, offered throughout the country live via satellite at corporate sites such as Hewlett-Packard, Texas Instruments, General Dynamics, and Alcoa Laboratories. Employees of these corporations in states such as Tennessee and Texas listen to and participate in classroom discussions with students and faculty at Chico. Some 130 corporate students are currently enrolled in the program, and, on its completion, they will receive a master's degree from Chico, without having to leave their job sites or visit the Chico campus.

The National Technological University, which was established in Colorado as a non-profit corporation in 1984 and is accredited by the North Central Association of Colleges and Schools, offers graduate engineering and technical courses to professionals at

DISPLAY 2 California Community College Satellite Network Down Link Sites, 1987

Source: Community College Satellite Network Fall Teleconference Schedule, 1987.

DISPLAY 3 California State University Educational Telecommunications Facilities and Operations, 1987

	Satellite				ITFS					Cable		
	Receiving Antenna	C or KU Band	Transmission Antenna	Transmission Access	Operational System	Simultaneous Broadcast Number of Active Channels	Number of Active Down Link Sites	Number of Students	Number of Courses	Interconnection	Number of Homes	Dedicated Channel
Bakersfield	Yes	C	No	No	No	0	0	N/A	N/A	No	40,000	No
Chico	Yes	C/Ku	Yes	Yes	Yes	1	16	400	25	Yes	N/A	No
Fresno	Yes	Ku	No	No	No	2	20	0	0	No	250,000	No
Fullerton	Yes	C/Ku	No		Yes	1	2	22	1	Yes	60,000	Yes
Hayward	Yes	C	No	No	No	N/A	N/A	N/A	N/A	Yes	70,000	Yes
Humboldt	Yes	C	No	No	No	N/A	N/A	N/A	N/A	No	N/A	No
Long Beach	Yes	N/A	No	No	Yes	2	0	N/A	N/A	No	50,000	No
Los Angeles	No	N/A	No	No	Yes	2	0	0	0	Yes	8,000	Yes
Northridge	No	N/A	No	No	Yes	4	10	176	22	No	60,000	No
Pomona	Yes	C/Ku	No	Yes	Yes	2	21	100	?	Yes	?	No
Sacramento	Yes	C/Ku	No	Yes	Yes	4	14	285	11	Yes	30,000	Yes
San Bernardino	Yes	C	No	No	Yes	1	3	88	3	No	60,000	Yes
San Diego	Yes	C	No	Yes	Yes	3	26	250	22	Yes	425,000	No
San Francisco	Yes	C/Ku	No	No	No	N/A	N/A	N/A	N/A	Yes	100,000	Yes
San Jose	Yes	C	No	Yes	Yes	4	8	209	20	Yes	90,000	Yes
San Luis Obsipo	Yes	C	No	No	No	N/A	N/A	N/A	N/A	Yes	0	No
Sonoma	No	C/Ku	No	No	No	0	0	0	0	Yes	0	No
Stanislaus	Yes	C/Ku	No	Yes	Yes	4	8	67	77	No	75,000	Yes
All Campuses	15		1	6	11	30	128	1,597	211	11	1,318,000	8

Note: The Dominguez Hills campus did not respond to the survey.

Source: Adapted from the "Educational Telecommunications Update," Office of the Chancellor, The California State University, March 1, 1987.

their work sites nationwide, including 16 in California at six different corporations -- Hewlett-Packard, IBM, Intel, General Instruments, NCR Corporation, and Pacific Telesis. It awards master's degrees in computer engineering, computer science, electrical engineering, engineering management, and manufacturing systems engineering by drawing on approved course offerings from the 24 participating accredited universities listed in Display 4, all of which are members of the Association for Media-Based Continuing Education for Engineers. All of the University's faculty teach from the campuses of those institutions, and their courses are transmitted via satellite, using "uplinks" at each of the universities and television receiving terminals at students' work sites. Nationwide, the University currently enrolls 1,100 students and has graduated six.

Microwave transmission of courses: A second important use of telecommunications at California State University, Chico is its upper-division and graduate program of courses in anthropology, economics,

DISPLAY 4 Institutions Participating in the National Technological University, 1987

Arizona State University
Boston University
Colorado State University
Georgia Institute of Technology
Illinois Institute of Technology
Iowa State University
Michigan Technological University
North Carolina State University
Northeastern University
Oklahoma State University
Purdue University
Southern Methodist University
University of Alaska
University of Arizona
University of Florida
University of Idaho
University of Kentucky
University of Maryland
University of Massachusetts
University of Minnesota
University of Missouri-Rolla
University of South Carolina
University of Washington
University of Wisconsin-Madison

Source: National Technical University, 1987.

ethnic studies, and sociology that it offers via microwave ITFS at 15 regional learning centers throughout northern California. Some 45 classes are taught on the Chico campus and simultaneously broadcast to the learning centers, which have two-way communication capabilities so that their students can participate in classroom discussions as well as talk with the instructors via telephone during regular office hours. While students can complete their entire degree program at these centers, campus representatives report that students tend to use them as entry points into the institution, to determine if they like university-level study and have the ability to do it. Between 500 and 800 students are enrolled at the centers during the current academic year.

An additional example of Chico's creative use of telecommunications is its joint master's degree program in mechanical engineering with California State University, Sacramento. Courses taught on the Sacramento campus by three participating faculty are broadcast live to the Chico campus, while the classes taught at Chico by its one participating faculty member are broadcast live to Sacramento. Students on both campuses have the advantage of a larger number of course offerings as well as faculty from both campuses.

Among San Diego State University's uses of telecommunications, its "Profnet Program" transmits telecourses leading to master-level degrees in business, computer science, and engineering to some 14 corporations in northern San Diego County. This program is similar to Chico State's, with the courses microwaved live so that students at each site have the ability to interact with faculty over speaker telephones.

Video and computer conferencing: A second important San Diego State University program is its Binational English/Spanish Telecommunications Network (BESTNET), which produces programs to improve instruction in mathematics and science for the Spanish-speaking population of the United States by using the latest video and computer conferencing technology. BESTNET was initiated in September 1985 with a grant from the Fund for the Improvement of Postsecondary Education (FIPSE), and involves a consortium of educational institutions in the United States and Mexico that produce video-computer interactive telecourses in mathematics, physics, engineering, and computer science. The courses are produced in Spanish, with an English translation dubbed onto the second audio channel of the video program recording. Students can listen to the courses in both English and Spanish, while utilizing bilingual texts and computer software. BESTNET officials believe that computer-mediated communication works particularly well for ethnic minority students, as (1) no social barriers interfere with the learning process, (2) students are required to be interactive rather than passive learners, (3) instruction is self-paced with instant feedback about errors, and (4) questions can be asked in an anonymous setting.

Telecourses: One of the largest telecommunications consortia in the United States is the Southern California Consortium for Community College Television, which was founded in 1970 and currently involves 26 community college districts and 45 colleges extending from Bakersfield to Southwestern Community College in Chula Vista. The consortium produces, acquires, and distributes general education telecourses to its member institutions, offering approximately 22 courses per year. These telecourses generally involve three components: (1) a video portion, either through open broadcast or cable, that is not interactive; (2) a print component, involving textbooks and study guides usually prepared by faculty members of the consortium institutions; and (3) on-campus instructors who typically meet with their classes approximately 15 hours per semester. Each of the consortium institutions selects from among the available courses those that they want to offer on their campus each semester. The consortium has recently become more active in producing and marketing telecourses which are sold nationally and frequently shown on the Public Broadcasting System via satellite.

Coastline Community College in Fountain Valley is one of California's leaders in designing, producing, and marketing telecourses. As it states in its *College Catalog*, it has a special commitment "to serve the needs of noncampus learners and those adults whose education has been interrupted by other life priorities" (1984, p. 46). Through the use of telecourses, it offers more than 1,400 classes annually at more than 80 neighborhood locations, and its telecourses are promoted and distributed to educational institutions in the United States, Canada, and other countries throughout the world.

Statewide, approximately 11,000 community college students enrolled in telecourses offered for credit in Fall 1987, involving 56 colleges and four disciplines (Display 5, below).

Computers for instruction: Creative uses of compuers for instruction by California colleges and universities include the High-Tech Center for the Disabled, located at the Community College Chancellor's Office in Sacramento. The center is experimenting with educational and vocational uses of adapted computer technology; that it defines as "any hardware or software system which, when used in conjunction with a microcomputer, provides systems access to disabled persons" (California Community Colleges, 1987, p. 1). The center was funded by a grant from the California Department of Rehabilitation and will establish projects at 40 California Community Colleges to provide functional computer access so that disabled students can participate fully in courses and programs in which computers are an integral part, as well as gain the general benefits associated with computer access, such as word processing, research, and computer-assisted instruction.

DISPLAY 5 Characteristics of California Community College Telecommunications Consortia, Fall 1987

Characteristic	Northern California Telecommunications Consortium	Bay Area Television Consortium
Geographical Region Served:	Fresno County to Butte and Lassen Counties	Alameda, Santa Clara, Monterey, and Mendocino Counties
Number of Courses:	Three	Three
Disciplines:	Business, Health Education, and Family and Consumer Science	Business, Anthropology, and Child Development
Number of Colleges:	Eleven	Fifteen
Number of Students:	1,403	2,792

Source: Commission staff telephone survey.

In response to control language in the 1984 Budget Act, the University of California developed a plan for the instructional use of computers that argued that the University's "leadership role in providing state-of-the-art instructional computing deteriorated during the recent period of constrained budgets," at the same time that "the varied aspects of computing are becoming increasingly central to academic excellence" (1984, p. 2). The plan presented a model for estimating instructional computer needs at the University and calculated the total cost of needed equipment for faculty and student use at $124 million.

Policies and actions by other states

The use of telecommunications in the delivery of postsecondary education services has been the subject of several recent state reports and conferences. In October 1985, the State Higher Education Executive Officers (SHEEO), in cooperation with the Council on Postsecondary Accreditation (COPA) issued a "Joint Statement of the Accreditation, Authorization, and Legal Task Force on Assessing Distance Learning Via Telecommunications," which proposed a set of common standards and policies that accrediting associations and state licensing agencies can use to ensure the quality and integrity of instruction delivered by electronic media. The task force developed this proposal through a year-long series of task force and advisory committee meetings throughout the country, resulting in general agreement by representatives of both SHEEO and COPA about the need to assess the quality of instruction by telecommunication through existing state oversight and non-governmental accreditation.

Interstate activities

In September 1986, SHEEO and the Western Interstate Commission for Higher Education (WICHE) convened a national conference to consider ways in which state policies can help higher education to integrate technology effectively into the learning process and provide expanded opportunities for more students. Participants in the conference agreed that the technologies offer a means to improve the effectiveness and accessibility of higher education, but that leadership is required to encourage creative experimentation and widespread use while preventing technology from determining educational goals.

Ten western states (Alaska, Colorado, Idaho, Montana, Nevada, North Dakota, Oregon, Utah, Washington, and Wyoming) have begun efforts under the leadership of WICHE to establish a multi-state telecommunications cooperative to "facilitate the sharing of telecommunications technologies, programs,

Southern California Television Consortium	Total
Kern County to San Diego County	23 Counties
Four	Ten
Business, History/Government, Science, and Humanities	Eight
Thirty	Fifty-Six
7,178	11,373

and resources, including faculty and technical experts, for educational and other purposes on an interstate basis" (Western Interstate Commission for Higher Education, 1987, p. 1). The participating states anticipate that interstate cooperation will result in large savings from three sources: (1) eliminating duplication of technology systems and sharing the costs of purchasing new equipment; (2) broadening participation of students in courses across state lines; and (3) eliminating duplication among offerings. The initiation of this WICHE cooperative is serving as a forum for coordinated planning, bringing together the key people active in telecommunications in the West. Although California has participated in some of the preliminary discussions for the cooperative, thus far it is not a formal member.

State initiatives

State activities in telecommunications differ considerably, depending upon available funds, anticipated needs, and institutional capabilities. While some states have a variety of systems in place, others are just initiating statewide planning efforts. Among those that have made some progress are the following:

Alaska: As a result of its immense size and diverse mix of educational needs, Alaska has placed considerable emphasis on the use of telecommunications. Prior to 1986, its "Learn Alaska Network" utilized satellite transmissions and low-power television transmitters to offer instructional television at both the school and higher education levels to almost all population centers. However, the decline in oil prices has caused Alaska to substantially reduce its telecommunications activities in higher education and terminate the Learn Alaska Network. An instructional television network is currently operated by Anchorage Community College utilizing satellite links and downlinks, and a new associate's degree program in general studies is being developed to be offered solely through telecommunications. However, financial constraints have caused the elimination of satellite live broadcasts and the use of videotapes instead.

Minnesota: The Minnesota Higher Education Coordinating Board has initiated a legislatively mandated study on telecommunications in elementary, secondary, and postsecondary education, that will inventory current activity, assess the costs and benefits involved in the utilization of the technology, examine out-of-state activity coming into Minnesota, determine the state's needs, and establish minimum standards for quality. The study results from legislative concern about growing expenditures and requests for additional expenditures for technological equipment, and it is scheduled for completion in Summer 1988.

Texas: In January 1985, the Coordinating Board of the Texas College and University System adopted rules and regulations requiring Board authorization for any public institution to offer televised instruction with state funding and imposed specific standards on this instruction to ensure quality. The board also directed its staff to review the evidence regarding the effectiveness of televised instruction and report on enrollments and grade distributions in classes offered through television by public colleges and universities in the state.

Virginia: The Virginia State Council of Higher Education appointed a statewide task force on telecommunications to develop "a new coordinated plan for telecommunications activities at Virginia's public colleges and universities" (Virginia State Council of Higher Education, 1987, p. 3). The task force completed an inventory of current capacity, examined current and planned activities in telecommunications-based instructional offerings, and identified issues and offered recommendations in three areas -- academic programs, finance and reporting, and approval and evaluation of offerings. Its recommendations apply to all telecommunications-based instructional offerings, including degree programs, individual credit courses, non-credit short courses, and teleconferences. The Council approved the task force report in September 1987. In addition, the Governor's Budget (1988-1989) contains money for capital expenditures for telecommunications. Institutions can apply for funding for projects.

Washington: The Washington Higher Education Telecommunications System was created in 1983 to support economic development efforts and links five locations in the state through microwave to transmit two-way audio and video signals. Graduate engineering and science courses are a major component of the courses offered on this system. In addition,

Eastern Washington University send advanced high school classes to rural schools through a satellite uplink acquired in 1986. Its first year of classes included advanced English, Japanese, pre-calculus, and Spanish.

Statewide planning in California

To date, California has no State plan for the use of telecommunications in education and, despite the several institutional and cooperative efforts described earlier, no statewide coordination of them. The California Commission on State Government Organization and Economy (the Little Hoover Commission) examined the organization and management of statewide telecommunications in California and, in a 1985 report, concluded that because of the absence of comprehensive planning, the State suffers inefficiencies in both investment and productivity:

> The State of California is not contemporary with major corporations and other states in its management of its own telecommunications systems. The state has not yet developed the organization and management system necessary to actively manage this quarter of a billion dollar asset. As a result, the state is missing an opportunity to offset rising telecommunications expenditures and costs by at least 50 million dollars annually (a conservative estimate).
>
> California . . . has made virtually no progress towards refining its strategic plan; assessing its telecommunications needs, developing a tactical plan, or establishing basic management systems . . . and the development of methods for taking complete advantage of the competitive market place. As a consequence, the state is missing productivity gains that have become literally commonplace in the private sector.
>
> The state has reacted to the growing use of telecommunications technology by establishing approval processes rather than planning processes . . . . Anticipatory analysis of alternatives -- planning -- has yet to be required (pp. 35-36).

Little has happened since 1985 to reduce those problems.

In the absence of State-level planning, institutions have creatively initiated various ways to acquire and utilize the new technologies to provide instruction on off-campus sites in California and outside the State. While this creativity is desirable and should be encouraged rather than inhibited, improved planning and coordination would have several positive results:

1. Greater savings in the purchase of equipment; assurance that equipment will be compitable and capable of interaction.
2. Expanded access for participation in courses and programs;
3. Reduced duplication of systems and course offerings;
4. Joint acquisition of hardware, programming, and software;
5. Partnerships with business and industry, offering opportunities for cost-effective access to equipment and assistance in curriculum enhancement from the ultimate employers of graduates with appropriate technological education;
6. Cooperative training for faculty and staff in the educational uses of telecommunication technologies; and
7. Attainment of State goals for quality, access, and efficiency in postsecondary education.

In its final report earlier this year, the Commission for the Review of the Master Plan for Higher Education concluded that the new information technologies "have the exciting potential for revolutionizing the educational process," with "interconnected networks allowing free movement of information between campuses, sharing of resources, elimination of unnecessary duplication, and support of instructional activities both on and off campus" (1987b, p. 36). It recommended that the California State University assume primary responsibility for researching and evaluating the impact of the new instructional technologies in the learning process. This research and evaluation is a necessary component of a comprehensive State planning effort. The Trustees of the California State University considered this recommendation at its meeting on November 11, 1987, when it

reviewed the recommendations of the Commission for the Review of the Master Plan.

Legislation enacted in 1984 (AB 2368, Chapter 972) directed the Regents of the University of California to report on the feasibility of establishing the California Institute for Telecommunications and Information Policy Research. In their response, the Regents stated that such an institute was both feasible and desirable, noting that "50 percent of the nation's workforce is currently engaged in the information sector of the economy," and "public and private resources devoted to technological development and industrial growth far outweigh the resources devoted to policy research. As a result, the expertise is scattered, fragmentary, and incomplete, and decision makers are compelled to react rather than exercising conscious direction" (University of California, 1985, p. 1). The Regents included funding for the institute in their 1986-87 budget request, but the Governor did not provide funding in his 1986 Budget. At present, plans for the institute still await implementation.

Conclusions

Based on the foregoing information, the Commission offers these four conclusions:

1. *Opportunities to be met*

The new instructional technologies provide California excellent opportunities to accomplish important long-range educational objectives efficiently. These opportunities include:

- The development and implementation of major curricular improvements at many public colleges and universities at a relatively reasonable cost -- for example, increasing the availability of foreign language instruction throughout the State by the transmission of existing courses to those campuses that currently do not have the capacity to offer them.
- Meeting the challenges of changing demographics in the student population, including the need for remediation, greater English literacy, and preparedness for postsecondary education.
- Expanded access to higher education for individuals who currently do not participate because of geographical isolation or language barriers.
- Expanded involvement in higher education for individuals with physical or learning disabilities through the use of adaptive technology that, for example, allows students with poor visual processing to hear what has been written.
- Increased offerings of high-demand academic programs, such as computer science and engineering, on more educational sites throughout the State in a relatively cost-effective manner.
- The development and implementation of an expanded and enriched high school curriculum utilizing faculty members of various colleges and universities -- particularly for advanced mathematics, science, and language courses that many high schools do not have the resources to offer.

2. *Objectives for State planning*

In order to utilize effectively the potential of the new technologies in serving educational objectives, while also containing the long-run costs to the State for the purchase and maintenance of equipment, it is imperative that statewide planning be initiated for these technologies in California postsecondary education. Effective State planning should seek to achieve three objectives:

- Maximum creativity in the utilization of the new technologies as well as their maximum utilization by all segments of the educational community.
- Efficient utilization of financial resources in the acquisition and maintenance of telecommunications equipment, which tends to be highly expensive.
- High quality educational offerings as well as the assurance that a review process exists to guarantee that minimum standards of quality are being met.

3. *Issues for action*

The following issues should be considered in the development of an effective State plan for technologies in postsecondary education:

- Quality control of courses offered off campus via telecommunications is needed for the benefit of students, educational institutions, and the State. Ideally, the primary responsibility for the content and the quality of instruction offered through the new technologies should rest with the faculty and the institutions that offer the programs, and these courses and programs should be reviewed through the same processes that institutions use to review their on-campus courses presented through traditional instructional modes. But the State should assure that these evaluation mechanisms are being utilized and that institutions are evaluating the effectiveness of televised and computer-mediated instruction as well as student success rates and satisfaction.

- Effective State-level planning for telecommunications in postsecondary education requires an inventory of existing State capacity (such as the kinds of investment already made) and an assessment of what the new technology should do (such as provide instruction, share resources, or transmit electronic mail). This inventory and needs assessment has not been completed in California, and consequently, the State is not in a position to utilize fully and efficiently the potential of the new technologies.

- The financing of expensive technology is integral to the planning process and must include the consideration of (1) alternative financing strategies, (2) funding for the operation and maintenance of the equipment, and (3) the relative priorities in the allocation of resources for on-campus instruction and for off-campus sites serving rural and other underserved populations. It is also imperative that "technology technicians" not be given free rein to push the planning and decision process in unnecessarily costly directions.

- Coordination is necessary to avoid unnecessary duplication and undesirable competition in the purchase and use of expensive equipment, both within each of the three systems of public higher education of the State and within regions involving public and private secondary schools, colleges, and universities. Currently, the necessary level of coordination does not exist in California.

- Faculty members are the key to the successful use of the new technologies, and the State therefore has an interest in promoting greater faculty awareness of the ways in which technology can be used to enhance learning. Existing incentives and disincentives in funding, faculty evaluation, and workload standards should be identified, so that greater support can be provided to the faculty in this area.

4. *Role of the Commission*

Because the Postsecondary Education Commission is the coordinating agency for the State, the Commission agrees that it has the responsibility to assume a major role in initiating this planning effort by convening within the next year a task force of representatives with expertise in the educational uses of the new technologies from California colleges and universities. It also agrees to provide liaison with the WICHE cooperative efforts, participating as appropriate in discussions and planning.

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CALIFORNIA POSTSECONDARY EDUCATION COMMISSION

THE California Postsecondary Education Commission is a citizen board established in 1974 by the Legislature and Governor to coordinate the efforts of California's colleges and universities and to provide independent, non-partisan policy analysis and recommendations to the Governor and Legislature.

Members of the Commission

The Commission consists of 15 members. Nine represent the general public, with three each appointed for six-year terms by the Governor, the Senate Rules Committee, and the Speaker of the Assembly. The other six represent the major segments of postsecondary education in California.

As of January 1988, the Commissioners representing the general public are:

Mim Andelson, Los Angeles
C. Thomas Dean, Long Beach, *Chairperson*
Henry Der, San Francisco
Seymour M. Farber, M.D., San Francisco
Lowell J. Paige, El Macero
Cruz Reynoso, Los Angeles, *Vice Chairperson*
Sharon N. Skog, Palo Alto
Thomas E. Stang, Los Angeles
Stephen P. Teale, M.D., Modesto

Representatives of the segments are:

Yori Wada, San Francisco; appointed by the Regents of the University of California

Claudia H. Hampton, Los Angeles; appointed by the Trustees of the California State University

Borgny Baird, Long Beach; appointed by the Board of Governors of the California Community Colleges

Harry Wugalter, Thousand Oaks; appointed by the Council for Private Postsecondary Educational Institutions

Kenneth L. Peters, Tarzana; appointed by the California State Board of Education

James B. Jamieson, San Luis Obispo; appointed by California's independent colleges and universities

Functions of the Commission

The Commission is charged by the Legislature and Governor to "assure the effective utilization of public postsecondary education resources, thereby eliminating waste and unnecessary duplication, and to promote diversity, innovation, and responsiveness to student and societal needs."

To this end, the Commission conducts independent reviews of matters affecting the 2,600 institutions of postsecondary education in California, including Community Colleges, four-year colleges, universities, and professional and occupational schools.

As an advisory planning and coordinating body, the Commission does not administer or govern any institutions, nor does it approve, authorize, or accredit any of them. Instead, it cooperates with other state agencies and non-governmental groups that perform these functions, while operating as an independent board with its own staff and its own specific duties of evaluation, coordination, and planning,

Operation of the Commission

The Commission holds regular meetings throughout the year at which it debates and takes action on staff studies and takes positions on proposed legislation affecting education beyond the high school in California. By law, the Commission's meetings are open to the public. Requests to address the Commission may be made by writing the Commission in advance or by submitting a request prior to the start of a meeting.

The Commission's day-to-day work is carried out by its staff in Sacramento, under the guidance of its executive director, William H. Pickens, who is appointed by the Commission.

The Commission publishes and distributes without charge some 40 to 50 reports each year on major issues confronting California postsecondary education. Recent reports are listed on the back cover.

Further information about the Commission, its meetings, its staff, and its publications may be obtained from the Commission offices at 1020 Twelfth Street, Third Floor, Sacramento, CA 98514; telephone (916) 445-7933.

EDUCATION OFFERED VIA TELECOMMUNICATIONS

California Postsecondary Education Commission Report 87-49

ONE of a series of reports published by the Commission as part of its planning and coordinating responsibilities. Additional copies may be obtained without charge from the Publications Office, California Postsecondary Education Commission, Third Floor, 1020 Twelfth Street, Sacramento, California 95814-3985.

Recent reports of the Commission include:

87-33 Information Manual: A Guide to the Commission, Its Policies, Procedures, and Members (September 1987)

87-35 Appropriations in the 1987-88 State Budget for the Public Segments of Higher Education: A Staff Report to the California Postsecondary Education Commission (September 1987)

87-36 Supplemental Report on Academic Salaries, 1986-87: A Report to the Governor and Legislature in Response to Senate Concurrent Resolution No. 51 (1965) and Subsequent Postsecondary Salary Legislation (September 1987)

87-37 Improving Student Performance Reporting, Review and Epilogue: The Final Report of the Commission's Project on Transforming Student Academic Performance Data into Useful Information (September 1987)

87-38 California College-Going Rates, 1986 Update: The Tenth in a Series of Reports on New Freshmen Enrollment at California's Colleges and Universities by Recent Graduates of California High Schools (September 1987)

87-39 The Infrastructure Needs of California Public Higher Education Through the Year 2000: A Presentation by William H. Pickens to the Joint Legislative Budget Committee, October 14, 1987 (October 1987)

87-40 Final Approval of San Diego State University's Proposal to Construct a North County Center: A Report to the Governor and Legislature Supplementing the Commission's February 1987 Conditional Approval of the Center (November 1987)

87-41 Strengthening Transfer and Articulation Policies and Practices in California's Colleges and Universities: Progress Since 1985 and Suggestions for the Future (November 1987)

87-42 Faculty Development from a State Perspective: A Staff Report to the California Postsecondary Education Commission in Response to Supplementary Language in the 1986 Budget Act (November 1987)

87-43 Evaluation of the California Student Opportunity and Access Program (Cal-SOAP): A Report to the Legislature and Governor in Response to Senate Bill 800 (Chapter 1199, Statutes of 1983) (December 1987)

87-44 The State's Role in Promoting Quality in Private Postsecondary Education: A Staff Prospectus for the Commission's Review of the Private Postsecondary Education Act of 1977, as Amended (December 1987)

87-45 Comments and Recommendations on *The Consortium of the California State University: A Report:* A Response to Supplemental Language in the 1987 Budget Act Regarding the Closure of the Consortium (December 1987)

87-46 Developments in Community College Finance: A Staff Report to the California Postsecondary Education Commission (December 1987)

87-47 Proposed Construction of the Permanent Off-Campus Center of California State University, Hayward, in Concord: A Report to the Governor and Legislature in Response to a Request for Capital Funds from the California State University for a Permanent Off-Campus Center in Contra Costa County (December 1987)

87-48 Articulating Career Education Programs from High School Through Community College to the Baccalaureate Degree: A Report to the Governor, Legislature, and Educational Community in Response to Assembly Bill 3639 (Chapter 1138, Statutes of 1986) (December 1987)

87-49 Education Offered via Telecommunications: Trends, Issues, and State-Level Problems in Instructional Technology for Colleges and Universities (December 1987)

87-50 California Postsecondary Education Commission News, Number 3 [The third issue of the Commission's periodic newsletter] (December 1987)